



DURASTACK™ PRO POSITIVE PRESSURE SYSTEMS

MODELS

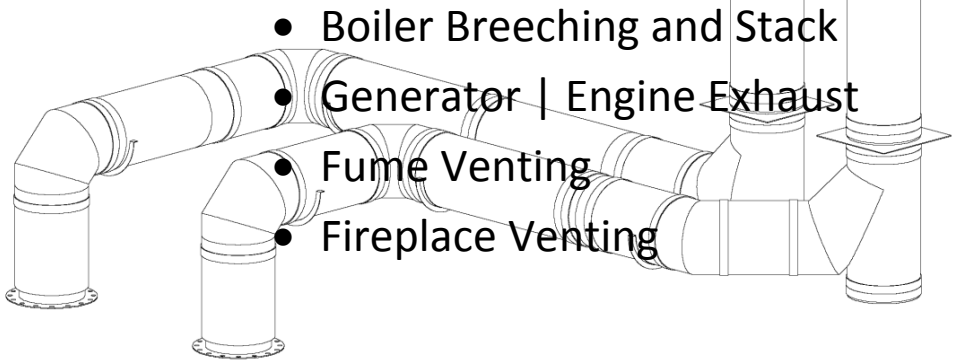
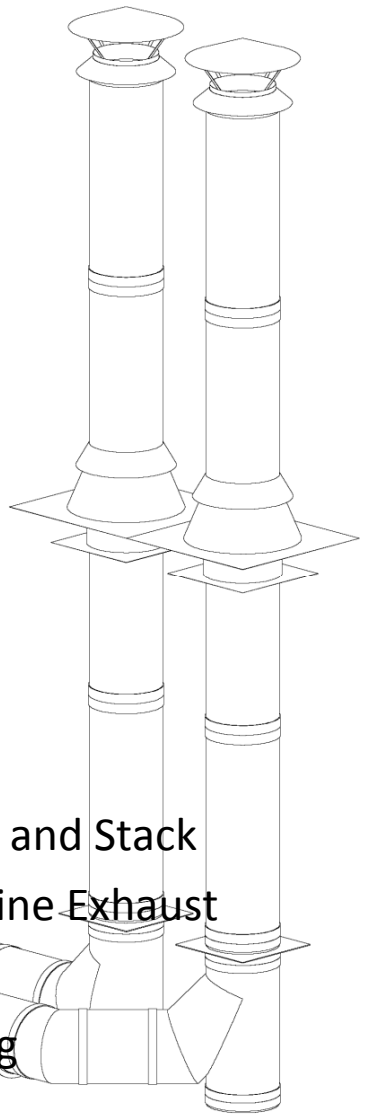
- DAS1** – 1 INCH AIR INSULATED
- DIS1** – 1 INCH CERAMIC FIBER INSULATED
- DIS2** – 2 INCH CERAMIC FIBER INSULATED
- DIS4** – 4 INCH CERAMIC FIBER INSULATED
- DCL** – SINGLE WALL

MATERIAL SELECTION	
FLUE (INNER WALL)	CASING (OUTER WALL)
<input type="checkbox"/> 304	<input type="checkbox"/> 304
<input type="checkbox"/> 316	<input type="checkbox"/> 441
	<input type="checkbox"/> GALVALUME

PROJECT:

PREPARED BY:

PREPARED FOR:



DURASTACK™ PRO

MODELS DCL, DAS1, DIS1, DIS2, DIS4

DCL- SINGLE WALL

DAS1- AIR INSULATED

DIS1, DIS2, DIS4 – FIBER INSULATED

SECTION A - CODE COMPLIANCE

UNDERWRITERS LABORATORIES LISTINGS

DURAVENT single wall Model DCL and double wall models DAS1, DIS1, DIS2 and DIS4 venting systems are listed by Underwriters Laboratories, Inc. (UL) in the following product categories and in the diameters indicated:

Model D A S - P R O (DAS1 - Double wall, 1" air insulation)	
Building Heating Appliance Chimney	5" - 36" ID
1400° Fahrenheit Chimney	5" - 36" ID

Models D I S - P R O (Double wall, DIS1, DIS2 or DIS4) where the number equals ceramic fiber insulation thickness	
Building Heating Appliance Chimney	5" - 36" ID
1400° Fahrenheit Chimney	5" - 36" ID
Building Heating Appliance Chimney (Type HT)	5" - 36" ID

APPLICATION

UL 103 Building Heating Appliance Chimney

Listing:

Under this category, models DAS-PRO and DIS-PRO have been determined suitable for venting flue gases at temperatures not exceeding 538°C (1000°F) under continuous operating conditions from gas, liquid, oil or solid fuel fired appliances. Also complies with operation (less than one hour) at temperatures not exceeding 740°C (1400°F) and brief operation (maximum 10 minutes) at temperatures not exceeding 906°C (1700°F). Building Heating Appliance Chimneys are suitable for use with Building Heating Appliances and Low Heat Appliances as described in the Chimney Selection Chart of National Fire Protection Association (NFPA) Standard NO. 211.

Building Heating Appliance Chimney (Type HT) Listing 5" to 24" DIS-PRO ONLY

Under this category (UL 103HT), the 5" through 24" ID DIS-PRO Models have qualified for UL's additional, optional "Type HT" rating (for Building Heating Appliance Chimneys) which indicates they have been evaluated and found suitable for exposure to 2100°F flue gases for a 10 minute duration at a specific clearance for each Model and diameter. Many local, state and regional code authorities require a "Type HT" rating for chimneys for certain appliance venting applications; especially solid fuel.

Building Heating Appliance Chimneys are suitable for use with Building Heating Appliances and other Low Heat Appliances as described in the Chimney Selection Chart of National Fire Protection Association (NFPA) Standard No. 211.

1400°F Chimney Listing - Under this category (UL 2561,ULC-C959), Model D A S - P R O and DISX-PRO have been determined suitable for venting flue gases continuously at a temperature not exceeding 1400°F, and a 10 minute intermittent service at temperatures not exceeding 1800°F. As such, Model DAS-PRO and DIS-PRO Models are suitable for use with ovens and furnaces as described in the Chimney Selection Chart of NFPA No. 211, in addition to other Applications.

Engine Exhaust

Based upon the above referenced UL Listings and supplemental, UL confirmed pressure testing, Model D A S - P R O and DIS-PRO are also suitable for use as complete exhaust systems for diesel engine and gas turbines. When Model DAS-PRO and DIS-PRO is used as an engine or turbine exhaust it is intended to be installed in accordance with NFPA 37 "Stationary Combustion Engines and Gas Turbines". This code states, "When such (flue gas) temperatures do not exceed 1000°F (538°C) except for infrequent, brief periods, the engines shall be classified as low heat appliances". For continuous operation over 1000°F and not exceeding 1400°F the exhaust system should be installed as a 1400°F Chimney.

Models D I S - P R O may be used to meet various needs, such as:

- Reduce outer pipe surface temperature.
- Reduce building heat gain by retaining energy inside the vent.
- Increase the efficiency of energy recovery systems by reducing exhaust gas temperature losses.
- Increase chimney or exhaust system draft loss performance due to reduced exhaust gas temperature drop.
- Reduce building noise levels caused by high speed or pulsating exhaust induced noise. NOTE: Specific tests have not been conducted to measure acoustic performance.

Models DAS-PRO and DIS-PRO exhaust systems are intended for use in connecting the heating appliance, engine, or turbine to the outdoors, while operating under positive forced draft, negative induced draft or neutral gravity flow internal pressure conditions. Models DAS-PRO and DIS-PRO (all insulation thicknesses) may be intermixed in the same chimney system, assuming the proper associated airspace clearances-to-combustibles are maintained.

ADDITIONAL APPLICATIONS

Models DCL, DAS1 and DIS-PRO are also suitable for negative, neutral or positive pressure pre-fabricated piping systems intended for use in a variety of applications including but not limited to the following: Fume Venting, Chutes, Particle Conveying, Dryer Vents and Ventilation Ducts.

SUITABLE FOR POSITIVE PRESSURE VENTING APPLICATIONS WITH MAXIMUM 60" WATER COLUMN INTERNAL STATIC PRESSURE AT 1000 DEGREES F.

MULTI-ENGINE EXHAUSTS

A common exhaust system for multiple engine or turbine installations is generally not recommended. Check with your engine or turbine manufacturer prior to common exhaust system design. Exhaust gas from operating units tends to flow to non-operating units where condensation may form. Water in engine or turbines at start-up may cause damage. In general, a separate exhaust system should be provided for each engine or turbine.

SECTION B - GENERAL INFORMATION

PART NUMBERS

These instructions identify major model parts by name and part number.

Example:

DIS1 - 36" length with inside diameter 14" made of 316SS flue (inner wall) and 304SS (outer casing).

DIS1 14 L36 BC
Model Dia. Part Material Type

DAS1 - 30° elbow with inside diameter 22" made of 30SS flue (inner wall) and galvalume (outer casing).

DAS1 22 E30 CE
Model Dia. Part Material Type

DCL - single wall support for 8" diameter grease duct made of galvalume.

DCL 8 WS E
Model Dia. Part Material Type

Use only factory-supplied components. Failure to do so will void the certification and the warranty of the grease duct system.

EFFECTIVE LENGTH

The effective length is the length of the part when it is assembled.

Effective length

L36.....36 1/16"
L24.....24 1/16"
L18.....17 9/16"
L12.....11 9/16"

CLEARANCE

DuraVent Models DCL, DAS-PRO and DIS-PRO are primarily intended to be used in a non-combustible surrounding. Only Models DAS-PRO and DIS-PRO can be used for either combustible or non-combustible surroundings. When installed in an open room where enclosure is not required, the chimney may be located at a minimum clearance to adjacent combustible walls in accordance with Table 1. The chimney may be located in corners formed by two combustible constructions (walls, floor, ceiling, supports, etc.)

NOTE: The clearance distance with the wall is the distance between the wall and the inner V-Band for model DCL or the Outer Band (BSE) for model DAS-PRO and DIS-PRO. See Table 1 for the clearance distance.

For non-combustible construction, maintain clearance as required for installation access for inspection or per local code. In buildings more than one story in height and in one-story buildings where the roof-ceiling assembly is required to have a fire resistance rating, the duct must be enclosed in a continuous enclosure from the lowest fire-rated ceiling or floor above the hood, through any concealed spaces, to or through the roof to maintain the integrity of the fire separations required by the applicable building code provisions. If the building is less than 4 stories in height, the enclosure shall have a fire resistance rating of not less than 1 hour. If the building is 4 stories or more in height, the enclosure shall have a fire resistance rating not less than 2 hours.

DuraVent models DAS-PRO and DIS-PRO chimneys may penetrate a combustible floor, wall, or roof using the appropriate parts and openings sizes. See Section D "Roof and Wall Penetration" for more details.

NOTE: Do not enclose with combustible materials

In the case of a fire rated enclosure made of non-combustible or limited combustible construction, the minimum clearance with the Model DCL must be 6" or as required by local code.

Vent Model	Flue Diameter Ø (in)	Clearance to Combustible (in)	Clearance to Non-Combustible (in)
DCL	5 to 36	18	0
	5 and 6	4	0
DAS1	7 to 14	5	0
	16 to 22	6	0
	24 to 30	7	0
	32 to 36	8	0
DIS1 (UL103 Type HT 5" to 24" only)	5 and 6	1	0
	7 to 14	2	0
	16 to 22	3	0
	24 to 30	4	0
DIS2 & DIS4 (UL103 Type HT 5" to 24" only)	32 to 36	5	0
	5 to 14	1	0
	16 to 30	2	0
	32 to 36	3	0

Dimensions are in inches

OPENING THROUGH CONSTRUCTION

The following table serves to identify the minimum opening required when installing a chimney through a floor, wall or roof made of combustible material. See Table 2.

Vent Model	Flue Diameter Ø (in)	Combustible Roof, Floor or Wall (in)	Non-Combustible Roof / Floor / Wall (in)	
			Installed Stacks (locking Bands Installed)	Uninstalled Stacks (NO locking Bands Installed)
DCL	5 to 36	ID + 37 – ¼"	ID + 2 – ½"	ID + 1 – 1/8"
DAS1	5 and 6	ID + 10 – ¾"	ID + 4 – ½"	ID + 2 – ¾"
	7 to 9	ID + 12 – ¾"		
	10 to 14	ID + 14 – ¾"		
	16 to 22	ID + 16 – ¾"		
	24 to 30	ID + 18 – ¾"		
DIS1	32 to 36	ID + 4 – ¾"	ID + 4 – ½"	ID + 2 – ¾"
	5 and 6	ID + 6 – ¾"		
	7 to 9	ID + 8 – ¾"		
	10 to 14	ID + 10 – ¾"		
	16 to 22	ID + 12 – ¾"		
DIS2	24 to 30	ID + 6 – ¾"	ID + 3 – ½"	ID + 4 – ¾"
	32 to 36	ID + 8 – ¾"		
	5 to 7	ID + 10 – ¾"		
	8 to 14	ID + 10 – ¾"		
DIS4	16 to 30	ID + 6 – ¾"	ID + 6 – ½"	ID + 8 – ¾"
	32 to 36	ID + 8 – ¾"		
	5 to 7	ID + 8 – ¾"		
	8 to 14	ID + 10 – ½"		
DIS4	16 to 30	ID + 10 – ¾"	ID + 10 – ½"	ID + 8 – ¾"
	32 to 36	ID + 12 – ¾"		
		ID + 14 – ¾"	ID + 9 – ½"	

Dimensions are in inches

PRODUCT WEIGHTS

The average weight of the duct, per foot of length, can be estimated using the following formula:

DCL	0.40	X	Diameter in inches	= lbs per foot
DAS1	0.79	X	Diameter in inches	= lbs per foot
DIS1	0.93	X	Diameter in inches	= lbs per foot
DIS2	1.09	X	Diameter in inches	= lbs per foot
DIS4	1.44	X	Diameter in inches	= lbs per foot

Chimney design should provide adequate support to ensure components are not overloaded.

THERMAL EXPANSION CALCULATIONS

Thermal expansion under normal operating temperatures can fatigue welds causing leakage. It is necessary to calculate the thermal expansion between two fixed points.

Formula: $[\text{Length (ft)} / 100] \times [\text{Temperature Rise degrees F} / 100]$

Example: $[50' / 100] \times [75^\circ\text{F} / 100] = 0.375''$ Expansion

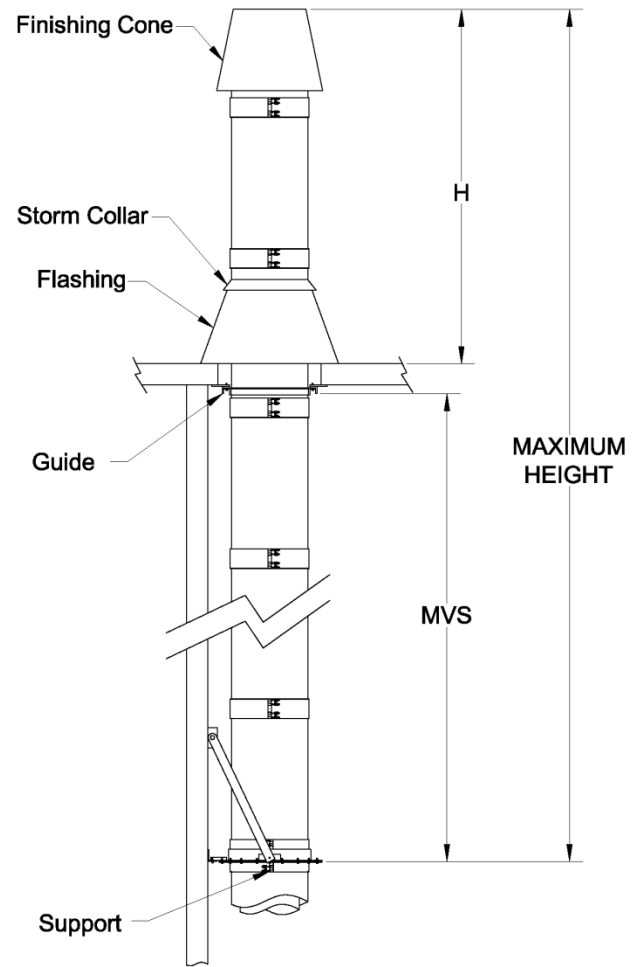
If the computed expansions between the fixed points are greater than 0.375" - DuraVent recommends an adjustable or bellow length be installed.

SUPPORT METHODS AND HEIGHT LIMITS

- Several support and guiding methods are used to anchor a chimney against upward, downward and angular displacement.
- These supports and guides used with thermal expansion devices, prevent bending stresses on the chimney elbows and joints.
- Supports and guiding methods and installation are described in **SECTION E-SUPPORTS**. Certain limitations apply for proper installation of supports and guides. See **Tables 3, 4 and 5 and Figures showing MVS and H**.
- It is recommended to apply an exterior grade high heat paint to any plate supports, full/half angle rings, wall supports/guides, aluminized outer maximum corrosion protection against the elements. (Ex: Rust-Oleum V200 series High Heat Industrial Aerosol)

NOTE:

All the weight of the section is supported by the inner flue.
Never support any chimney pipe from the outer casing.



See Table 3 & 4 for Maximum Dimensions MVS and H
Maximum freestanding Stack Height

TABLE 3 – Height Limits for each Type of Support						
Parts	Flue Diameter Ø (in)	HEIGHT (ft)				
		DCL	DAS1	DIS1	DIS2	DIS4
Anchor Plate	5 to 22	264	133	114	97	73
	24 to 36	161	82	70	59	45
Anchor Plate with Length	5 to 22	281	142	121	103	78
	24 to 36	172	87	74	63	48
Base Supported Tee	5 to 22	102	52	44	37	28
	24 to 36	63	32	27	23	17
Wall Support	5 to 22	105	53	45	39	29
	24 to 36	64	32	28	24	18

⚠ WARNING Do not attach any supports to combustible

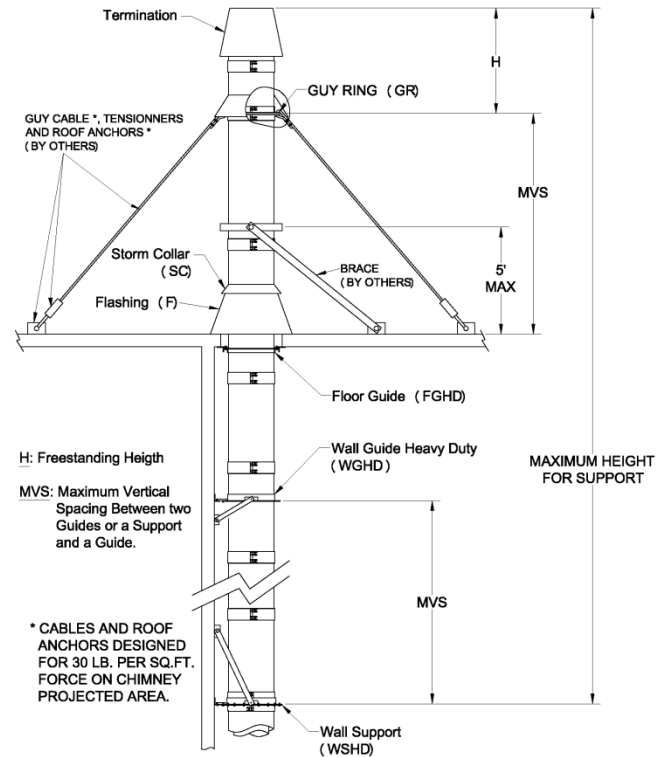
Dimensions are in inches (diameter) and feet (distance)

TABLE 4 Maximum Vertical Spacing between ANY Guide / Supports and Maximum Freestanding above the Roof								
MODEL	DCL		DAS1 / DIS1		DIS2		DIS4	
	HEIGHT (ft)		HEIGHT (ft)		HEIGHT (ft)		HEIGHT (ft)	
Flue Diameter Ø (in)	MVS*	H*	MVS*	H*	MVS*	H*	MVS*	H*
5	20	8' 6"	20	7' 3"	20	6' 6"	20	5' 9"
6	20	9' 6"	20	8' 3"	20	7' 6"	20	6' 9"
7	20	10'	20	8' 9"	20	8' 3"	20	7'
8	20	10' 9"	20	9'	20	8' 6"	20	7' 3"
9	20	11' 6"	20	9' 3"	20	8' 9"	20	7' 6"
10	20	12'	20	9' 6"	20	9'	20	7' 9"
11	20	12' 6"	20	9' 9"	20	9' 3"	20	8'
12	20	13'	20	10'	20	9' 6"	20	8' 3"
13	20	13' 6"	20	10' 3"	20	9' 9"	20	8' 6"
14	20	14'	20	10' 6"	20	10'	20	9'
16	20	14' 6"	20	11'	20	10' 6"	20	9' 6"
18	20	15'	20	11' 6"	20	11'	20	10'
20	20	15'	20	12'	20	11' 6"	20	10' 9"
22	20	15'	20	12' 3"	20	11' 9"	20	11'
24	20	15'	20	12' 9"	20	12' 3"	20	11' 6"
26	20	15'	20	13'	20	12' 6"	20	12'
28	20	15'	20	13' 6"	20	13'	20	12' 3"
30	20	15'	20	13' 9"	20	13' 6"	20	12' 9"
32	20	15'	20	14' 3"	20	13' 9"	20	13' 3"
34	20	15'	20	14' 6"	20	14' 3"	20	13' 6"
36	20	15'	20	15'	20	14' 6"	20	13' 9"

MVS* Maximum Vertical Spacing between two (2) Guides or Support and Guide in a Vertical Position

H** Maximum Freestanding Height above the roof. This limited height is due to wind loads.

Dimensions are in inches (diameter) and feet (distance)



See Table 3 & 4 for Maximum Dimensions MVS and H

Chimneys Height with rigid bracing or guying option

EXTERIOR CORROSION PROTECTION

It is recommended to apply an exterior grade high heat paint to any plate supports, full/half angle rings, wall guides, aluminized outer walls for corrosion protection against the elements.

EX: Rust-Oleum V200 series High Heat Industrial Aerosol

SEISMIC REQUIREMENTS

In certain areas of the country, local codes contain requirements to address seismic risks. Seismic requirements for chimneys and grease ducts usually include specifications for additional "sway bars" / bracing, or similar devices in order to help stabilize the system in the event of an earthquake.

Specific guidelines (including spacing, location, size and method of attachment of bracing / sway bars or other devices for addressing seismic requirements vary depending upon the adopted code, seismic zone, duct size, location in building, etc. and are not within the scope of this document.

Consult with a design professional in order to determine compliance options for these potentially complex requirements when this product is to be installed in a building where these additional requirements apply.

The support methods described in this document have been proven adequate (via UL certification) for locations where there are no additional seismic zone requirements. In order to address additional seismic requirements they may be further supplemented with a variety of generic sway bars or braces that attach to or around the outer wall of the chimney / grease duct system. Full Angle Rings (FAR) and Half Angle Rings (HAR) may be included as components of such supplemental bracing.

TABLE 5 – maximum Horizontal Spacing between each Guide / Support						
Product	Flue Diameter Ø (in)	Distance (ft)				
		DCL	DAS1	DIS1	DIS2	DIS4
Half Angle Ring (HAR) / Full Angle Ring (FAR) / Anchor Support (AP) / Anchor Plate with Length (APL) / Heavy Duty Wall Guide (HDWG)	5 to 12	23	23	19	16	12
	14 to 24	19	19	16	14	10
	26 to 36	15	15	13	11	8

Dimensions are in inches (diameter) and feet (distance)

SECTION C - PIPE & FITTING JOINT ASSEMBLY

The ends of each inner pipe are made of flanges. All the joints between sections are flange-to-flange of the inner pipe.

⚠ CAUTION: SHARP SHEET METAL, RISK OF CUTS WITH SLEEVES AND SECTIONS.

All sections have an unattached alignment sleeve (See figure 5). The alignment sleeve facilitates alignment of adjacent sections and provides a backing for the sealant applied to flange face keeping it in the intended location. It may either be placed on the outlet end section or in the downstream section. It is not a required part, which means that it might not be used at all.



Figure 5 – Feature Alignment Sleeve

SEALANT USAGE

Part No. S-650 – (Permatex® Red High Temp Silicone) is red and is one of our UL approved sealants for temperatures up to 650°F. Can be used for V-Channel Bands and for weathering/sealing where necessary.

Part No. S-2000 – A high temperature pre-mixed sealant for flue gas temperature up to 2000°F. S-2000 is water soluble and should not be used where exposed to weather

Part No. S-375 – (Nuflex 302 General Purpose) is a low temperature grey silicone (450°F) only for weathering/sealing on outdoor seams and Outer Band (BSE) where necessary.

STEP 1

Apply a continuous bead of S-650 or S-2000 sealant in the V-Clamp groove of the locking band.

NOTE: Sealant is supplied by DuraVent - individual tubes are marked S-650 or S-2000. See TABLE 6 for number of tubes per joint.

CAUTION: THE USE OF ANY OTHER SEALANT IS NOT RECOMMENDED, MAY VOID CERTIFICATION AND MAY IMPAIR THE SEALING EFFECTIVENESS.



Figure 6 – Joint Assembly Step 1

STEP 2

Apply a continuous bead of S-650 or S-2000 sealant ¼" wide to one of the flanges to be joined.



Figure 7 – Joint Assembly Step 2

STEP 3

Join the two flanged ends of the duct section together and rotate slightly to ensure complete coverage of sealant on flanges

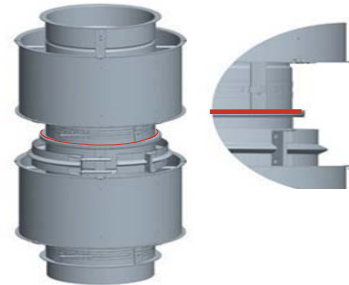


Figure 8 – Joint Assembly Step 3

STEP 4

Install the V-Band around the flanges making sure the flanges are located within the V-clamp

NOTE: Do not locate V-Band hardware at the bottom side of the horizontal duct joints

NOTE 1: Light tapping with a hammer all around the band while tightening bolts helps align and pull flanges together

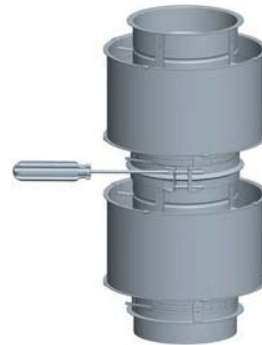


Figure 9 – Joint Assembly Step 4

STEP 5 (DIS1, DIS2, DIS4 - ONLY)

Install the supplied insulation strips between the sections to ensure that all air gaps are filled. Be sure that insulation is tightly packed and completely fills the void between flue and closure band when assembled.

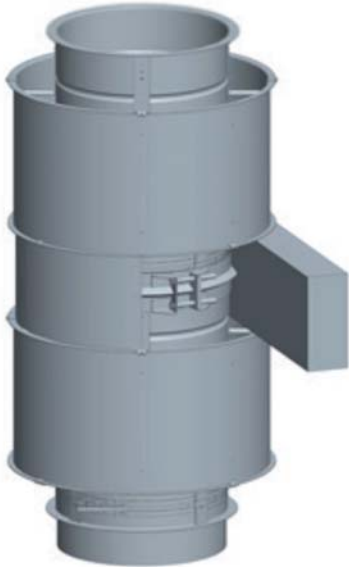


Figure 10 – Joint Assembly Step 5

STEP 6

Secure the Outer Casing Band with the Outer Band (BSE). Joint installation is now completed.

NOTE:

For exterior installations it is recommended to seal the band with S-375 sealant to prevent water from entering.



Figure 11 – Joint Assembly Step 6

TABLE 6 - Expected number of Tubes of S-2000 or S-650 per Joint Assembly

Flue Diameter ϕ (in)	Number of tube per Joint
5	1/5
6	1/5
7	1/5
8	1/5
9	1/5
10	1/5
11	1/4
12	1/4
13	1/4
14	1/4
16	1/4
18	1/3
20	1/3
22	1/3
24	1/2
26	1/2
28	1/2
30	2/3
32	2/3
34	2/3
36	2/3

SECTION D-COMPONENTS

HIGH PRESSURE SYSTEM – up to 60” WC THERMAL EXPANSION JOINT and ODD LENGTH

For Thermal Expansion we recommend using a Bellow Length (LB).
For ODD Length we recommend using a Variable Length (LV).

LOW PRESSURE SYSTEM – up to 6” WC THERMAL EXPANSION and ODD LENGTH

For thermal Expansion and ODD Length we recommend using an Adjustable Length (LA).

THERMAL EXPANSION

The inner pipe of Model DAS-PRO and DIS-PRO is load bearing and its thermal expansion is the same as that of a continuous pipe. A simplified rule for exhaust pipe expansion estimation is that the axial growth will be approx. 1” per 100’ of pipe length for each 100°F the flue gas temperature is above the surrounding air temperature.

See Thermal Expansion Formula on page 3.

When assembled in any orientation, the amount of thermal expansion of the inner pipe is directly dependent on the inner wall temperature and the length of pipe between fixed points. Good installation practice requires that expansion greater than 1/4 inch will be compensated for using a Bellows Joint or Adjustable Length, depending on the maximum pressure encountered.

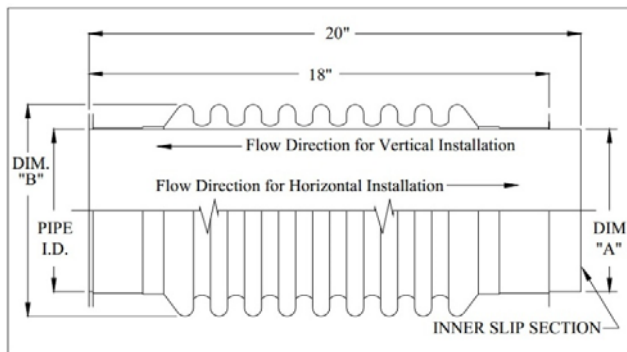
The flanged inner piping joints have negligible flexing capacity, and in addition, tees and elbows are not designed to withstand bending moment forces. Because the amount of outer casing axial movement is the same as inner casing movement, the outer jackets of piping must slide to avoid excessive forces on Tees, Elbows of fixed points. To accommodate outer casing movements, external guides along walls at floors or in lateral breechings must allow for movement of pipe.

BELLOWS LENGTH

For exhaust pressure to 60 inches of water column, Bellows are recommended for expansion and vibrational movements of the piping.

The Bellows has a 0.035” thick or heavier straight stainless steel liner to protect the thinner spring material from heat and flow effects. It is used anywhere in a system for axial and vibrational movements only and must be accurately supported and guided. This part has limited lateral movement (1/8” max.) and lateral offsets and parallel misalignments should be eliminated. The purpose of the liner is to minimize contact, smooth flow, control erosion and eliminate resonance caused by exhaust gases passing through the bellows. See Table 7 for Bellows Properties

Typical Bellow design



Flue Diameter Ø (in)	Bellow Outside Diameter	Bellows number convolution	Material thickness (in)	nb of ply	Axial Spring Rate	Axial Compression (in)
5	6 1/4	14	0.011	2	124	3
6	7 1/4	14	0.011	2	139	3
7	8 3/8	14	0.011	2	151	3
8	9 3/8	12	0.011	2	162	3
9	10 3/8	12	0.011	2	173	3
10	11 3/8	12	0.011	2	184	3
11	12 3/8	12	0.011	2	197	3
12	13 3/8	12	0.011	2	210	3
13	15	8	0.011	2	139	3
14	16	8	0.011	2	149	3
16	18	8	0.011	2	159	3
18	20	8	0.011	2	169	3
20	22	8	0.011	2	181	3
22	24	8	0.011	2	193	3
24	26	8	0.011	2	205	3
26	28	8	0.011	2	216	3
28	30	8	0.011	2	229	3
30	32	8	0.011	2	242	3
32	34	8	0.011	2	255	3
34	36	8	0.011	2	268	3
36	38	8	0.011	2	281	3

Dimensions are in inches (diameter) and pound/inch (Axial Spring Rate)

ADJUSTABLE LENGTH (LA) - EXPANSION JOINT

The LA has two functions. It is used to compensate for thermal expansion and make up odd lengths of vent..

It is shipped with graphite band assembly preassembled on the sliding inner pipe. The LA is adjustable from 7 1/4 to 28 3/8 inch. See Figure 15

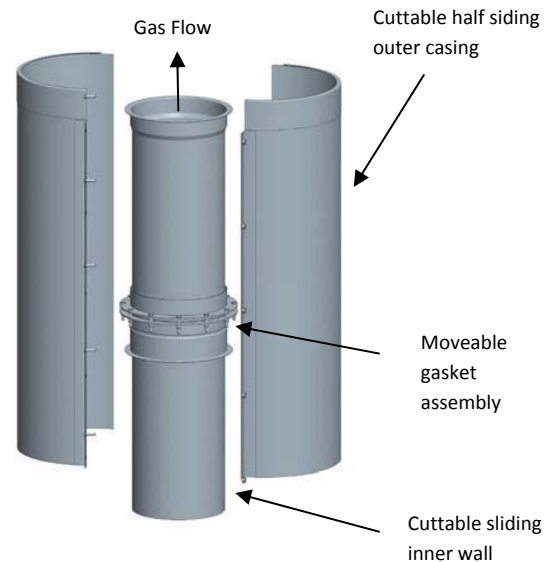
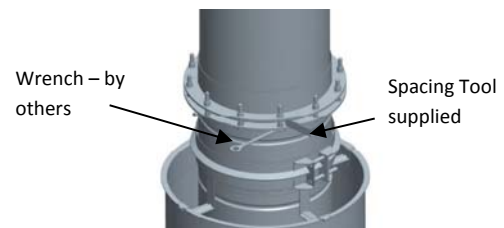


Figure 15 – Adjustable Length (LA)



VARIABLE LENGTH (LV)

The Variable Length (LV) has one major function. It makes up odd lengths of duct. It must not be used for expansion compensation.

It is shipped with a flanged retaining band assembly on the inner sliding wall. The LV is adjustable from 7 1/2 to 28 inch. See Figure 16.

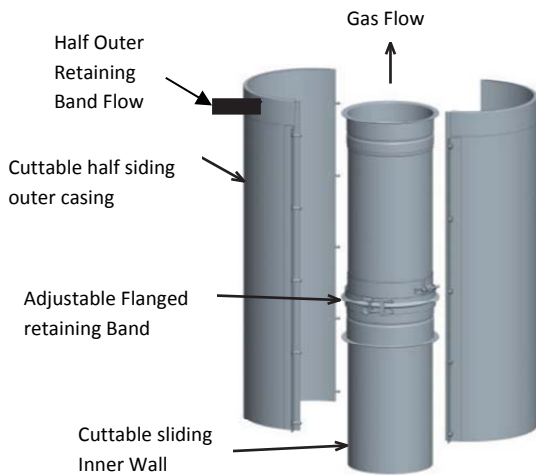


Figure 16 – Variable Length (LV)

TEES

90° TEE (T90)

The 90° Tee is generally used to connect horizontal connectors into a vertical section as well as a drain or inspection fittings.

NOTE: For the maximum height of chimney above a based supported Tee, see Table 4 in the SUPPORT METHODS AND HEIGHT LIMITS section.

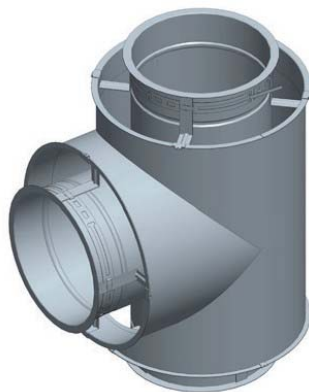


Figure 17 – T90

TEE PRECAUTION

1. Use an adjustable length in all horizontal breechings or laterals.
2. If more than 1/4" of thermal expansion is expected between the tee and the next fixed support point;
 - a. The tee should be protected from bending moments by use of an Adjustable Length (See the section on the Adjustable Length)
 - b. And the use of two axis support is recommended.
3. Provide access for easy removal of Tee Caps.

45 TEE (T45) and DOUBLE 45 TEE (TD45)

See Figure 18 for the 45 Tee (T45) and Figure 19 for the Double Tee (DT45) Isolate these Tees from the effectiveness of Thermal Expansion.



Top Figure 18 T45 | Bottom | Figure 19 |Double Tee 45 (DT45)

LATERAL TEE (BT)

The Lateral Tee (BT) is a 45 Tee with a 45 Elbow integrated in it.

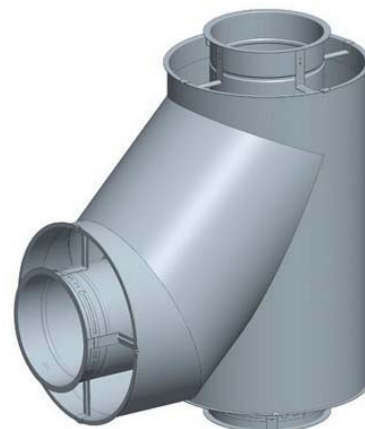


Figure 20 Lateral Tee (BT)

TEE CAP (TC)

The Tee Cap provides access for cleaning and inspection into the duct. Usually on horizontal runs, the Tee Cap is used to close the unused port of any Tee and for cleanout or access purposes only. When using clean-outs, always seal the connection to prevent leaks and assure that the duct functions as intended. See Figure 21

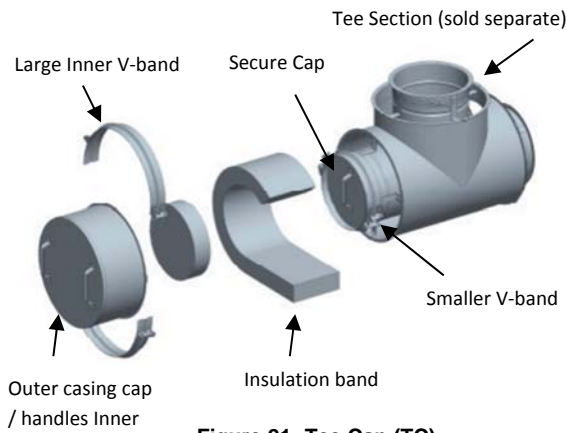


Figure 21- Tee Cap (TC)

DRAIN TEE CAP (DTC)

The Drain Cap (DTC) is used as a drain for the base of vertical installation and must be connected to a suitable disposable point. It can also be used as an access for cleanouts or access purpose. See Figure 22.

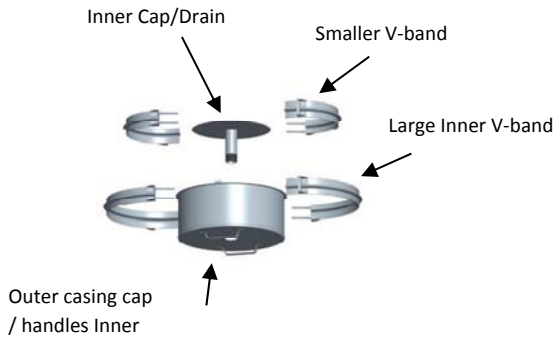


Figure 22 – Drain Tee Cap (DTC)

ELBOWS

ELBOWS (E3, E15, E30, E45, E90)

Elbows are used for changes in direction in horizontal or vertical portions of a duct system. All elbows feature the standard joint assembly as described in JOINT ASSEMBLY section. Elbows are used in combination to make different angles ranging from 3° to 90° in horizontal and vertical segments of the duct system.

ELBOW – 3 degree (E3)

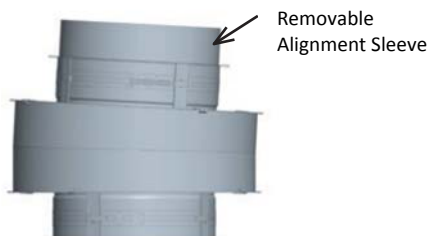


Figure 23 – Elbow 3 Degree (E3)

ELBOW 15 degree (E15)

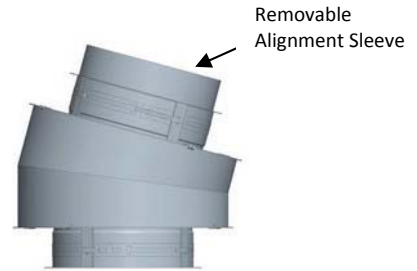


Figure 24 – Elbow 15 degree (E15)

ELBOW 30 degree (E30)

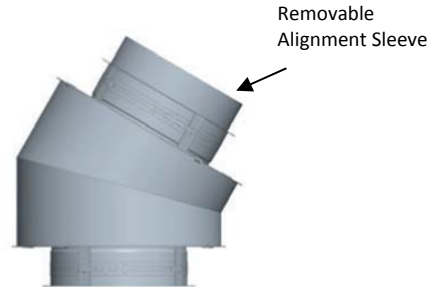


Figure 25 – Elbow 30 degree (E30)

ELBOW 45 degree (E45)

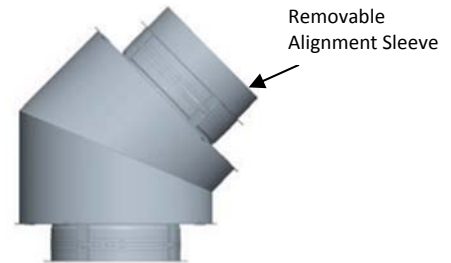


Figure 26 – Elbow 45 degree (E45)

ELBOW 90 degree (E90)

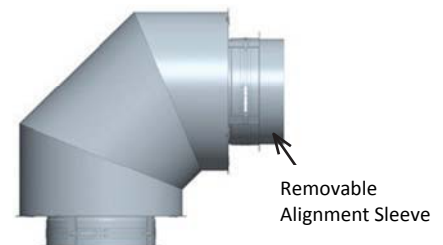


Figure 27 – Elbow 90 degree (E90)

Elbows are not designed to take bending loads and must be structurally supported. Structural parts such as posts or beams may also be needed to hold chimney supports in position.

There is no limit on the angle or slope of an offset for gas or liquid fuel burning appliances.

NOTE: There is a limit of 30 degree offset for solid fuel appliance

ELBOW OFFSETS

The following tables provide the MINIMUM offsets for the various elbows **Table 8a, 8b, 8c and 8d**



Figure 28 – MINIMUM OFFSET for ELBOWS

TABLE 8a - Minimum Offset for Each Elbow - DCL

Diameter Ø (in)	3°	15°	30°	45°	90°
5	3/8	2	4 1/8	6 1/4	13 1/4
6	3/8	2	4 1/4	6 5/8	14 1/4
7	3/8	2	4 3/8	6 7/8	15 1/4
8	3/8	2	4 1/2	7 1/8	16 1/4
9	3/8	2 1/8	4 5/8	7 1/2	17 1/4
10	3/8	2 1/8	4 3/4	7 3/4	18 1/4
11	3/8	2 1/8	4 7/8	8	19 1/4
12	3/8	2 1/8	5	8 3/8	20 1/4
13	3/8	2 1/4	5 1/8	8 5/8	21 1/4
14	3/8	2 1/4	5 1/4	8 7/8	22 1/4
16	3/8	2 3/8	5 1/2	9 1/2	24 1/4
18	3/8	2 3/8	5 3/4	10 1/8	26 1/4
20	3/8	2 1/2	6 1/8	10 5/8	28 1/4
22	3/8	2 1/2	6 3/8	11 1/4	30 1/4
24	3/8	2 5/8	6 5/8	11 7/8	32 1/4
26	3/8	2 5/8	6 7/8	12 1/2	34 1/4
28	3/8	2 3/4	7 1/8	13	36 1/4
30	3/8	2 3/4	7 3/8	13 5/8	38 1/4
32	3/8	2 7/8	7 5/8	14 1/8	40 1/4
34	3/8	3	8	14 3/4	42 1/4
36	3/8	3	8 1/4	15 3/8	44 1/4

Dimensions are in inches

Diameter Ø (in)	Minimum Offset for Each Elbow - DAS1 & DIS1				
	3°	15°	30°	45°	90°
5	1/2	2 1/2	5 1/4	8 1/4	18 1/2
6	1/2	2 1/2	5 3/8	8 1/2	19 1/2
7	1/2	2 5/8	5 1/2	8 3/4	20 1/2
8	1/2	2 5/8	5 3/4	9 1/8	21 1/2
9	1/2	2 5/8	5 7/8	9 3/8	22 1/2
10	1/2	2 5/8	6	9 5/8	23 1/2
11	1/2	2 3/4	6 1/8	10	24 1/2
12	1/2	2 3/4	6 1/4	10 1/4	25 1/2
13	1/2	2 3/4	6 3/8	10 1/2	26 1/2
14	1/2	2 3/4	6 1/2	10 7/8	27 1/2
16	1/2	2 7/8	6 3/4	11 3/8	29 1/2
18	1/2	3	7	12	31 1/2
20	1/2	3	7 1/4	12 5/8	33 1/2
22	1/2	3 1/8	7 5/8	13 1/8	35 1/2
24	1/2	3 1/8	7 7/8	13 3/4	37 1/2
26	1/2	3 1/4	8 1/8	14 3/8	39 1/2
28	1/2	3 1/4	8 3/8	14 7/8	41 1/2
30	1/2	3 3/8	8 5/8	15 1/2	43 1/2
32	1/2	3 3/8	8 7/8	16 1/8	45 1/2
34	1/2	3 1/2	9 1/8	16 3/4	47 1/2
36	1/2	3 1/2	9 1/2	17 1/4	49 1/2

Dimensions are in inches

TABLE 8c	Minimum Offset for Each Elbow - DIS2				
	Diameter Ø (in)	3°	15°	30°	45°
5	1/2	2 5/8	5 1/2	8 3/4	20 1/2
6	1/2	2 5/8	5 3/4	9 1/8	21 1/2
7	1/2	2 5/8	5 7/8	9 3/8	22 1/2
8	1/2	2 5/8	6	9 5/8	23 1/2
9	1/2	2 3/4	6 1/8	10	24 1/2
10	1/2	2 3/4	6 1/4	10 1/4	25 1/2
11	1/2	2 3/4	6 3/8	10 1/2	26 1/2
12	1/2	2 3/4	6 1/2	10 7/8	27 1/2
13	1/2	2 7/8	6 5/8	11 1/8	28 1/2
14	1/2	2 7/8	6 3/4	11 3/8	29 1/2
16	1/2	3	7	12	31 1/2
18	1/2	3	7 1/4	12 5/8	33 1/2
20	1/2	3 1/8	7 5/8	13 1/8	35 1/2
22	1/2	3 1/8	7 7/8	13 3/4	37 1/2
24	1/2	3 1/4	8 1/8	14 3/8	39 1/2
26	1/2	3 1/4	8 3/8	14 7/8	41 1/2
28	1/2	3 3/8	8 5/8	15 1/2	43 1/2
30	1/2	3 3/8	8 7/8	16 1/8	45 1/2
32	1/2	3 1/2	9 1/8	16 3/4	47 1/2
34	1/2	3 1/2	9 1/2	17 1/4	49 1/2
36	1/2	3 5/8	9 3/4	17 7/8	51 1/2

Dimensions are in inches

TABLE 8d	Minimum Offset for Each Elbow - DIS4				
	Diameter Ø (in)	3°	15°	30°	45°
5	1/2	2 3/4	6 1/8	10	24 1/2
6	1/2	2 3/4	6 1/4	10 1/4	25 1/2
7	1/2	2 3/4	6 3/8	10 1/2	26 1/2
8	1/2	2 3/4	6 1/2	10 7/8	27 1/2
9	1/2	2 7/8	6 5/8	11 1/8	28 1/2
10	1/2	2 7/8	6 3/4	11 3/8	29 1/2
11	1/2	2 7/8	6 7/8	11 3/4	30 1/2
12	1/2	3	7	12	31 1/2
13	1/2	3	7 1/8	12 1/4	32 1/2
14	1/2	3	7 1/4	12 5/8	33 1/2
16	1/2	3 1/8	7 5/8	13 1/8	35 1/2
18	1/2	3 1/8	7 7/8	13 3/4	37 1/2
20	1/2	3 1/4	8 1/8	14 3/8	39 1/2
22	1/2	3 1/4	8 3/8	14 7/8	41 1/2
24	1/2	3 3/8	8 5/8	15 1/2	43 1/2
26	1/2	3 3/8	8 7/8	16 1/8	45 1/2
28	1/2	3 1/2	9 1/8	16 3/4	47 1/2
30	1/2	3 1/2	9 1/2	17 1/4	49 1/2
32	1/2	3 5/8	9 3/4	17 7/8	51 1/2
34	1/2	3 3/4	10	18 1/2	53 1/2
36	1/2	3 3/4	10 1/4	19	55 1/2

Dimensions are in inches

ADAPTERS

TAPERED INCREASER (TIN Ø)

The Tapered Increaser Adapter is used for a diameter change in the vent system. Used when there is a sufficient length for duct run available for the size change. The TINØ is uses 2" of length per 1" increment diameter change. The TINØ is considered to have the same load strength as a straight duct. See Figure 29.

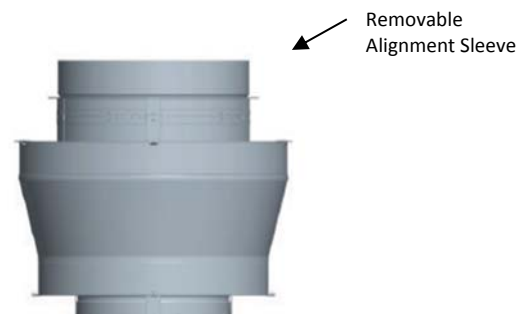


Figure 29 – Tapered Increaser Adapter (TIN Ø)

ECCENTRIC TAPERED INCREASER (ETINØ)

The Eccentric Tapered Increaser Adapter is similar as the Tapered Increaser Adapter except the smaller diameter is offset from the larger diameter. When installed horizontally, the **ETINØ** keep a flat slope unlike the **TINØ**. See **Figure 30**.

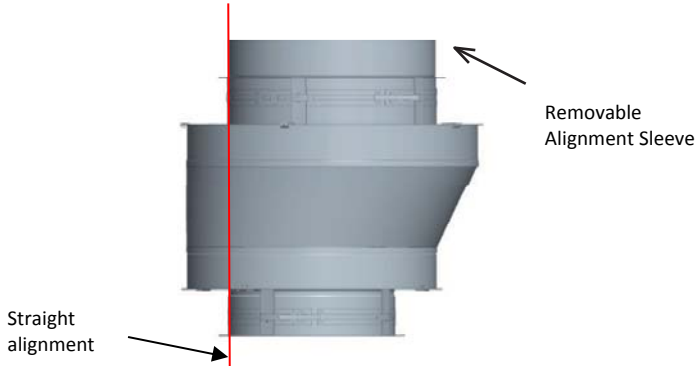


Figure 30 – Eccentric Tapered Increaser Adapter (ETINØ)

PLATE AND WALL SUPPORT

ANCHOR PLATE (AP)

Anchor Supports are designed to provide support to vertical sections and provide fixed-point support for horizontal sections. See **Figure 31**

NOTE: Rings are installed at 90° to plates.

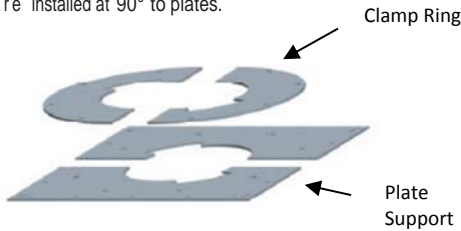


Figure 31 – Anchor Plate (AP)

The Plate Support must be attached to the building structure or supported with rigid structural members. See **Table 4** for maximum supported height.

A Plate Support is to be attached only to non-combustible construction such as block, concrete or steel with clearance that is adequate for installation and access. For maximum support, the entire perimeter of the Plate Support must be attached to structural framing.

⚠ WARNING: RISK OF FIRE - DO NOT ATTACH THE PLATE SUPPORT TO COMBUSTIBLE CONSTRUCTION

HEAVY DUTY WALL SUPPORT (WSHD)

When attached to a non-combustible wall with brackets and struts, a Heavy Duty Wall Support makes up a fixed-point. The clamp rings are installed with the splits 90° apart so that they support each other. The notches in the clamp rings are aligned with the draw screws of the flange band. The Heavy Duty Wall Support Assembly is bolted together with provided hardware. It is made with adjustable struts, which allows a variable clearance from the non-combustible wall to the grease duct outer casing.

The minimum clearance varies with the size of the wall support, but is between 2 and 2 ½" (based on the angle shape of the Full Angle Ring (FAR). See **Figure 33**. The maximum clearance for all sizes is around 10". See **Figure 34**



Figure 32 – Heavy Duty Wall Support (WSHD)

Illustration below shows the Heavy Duty Wall Support at the **MINIMUM** distance from structure

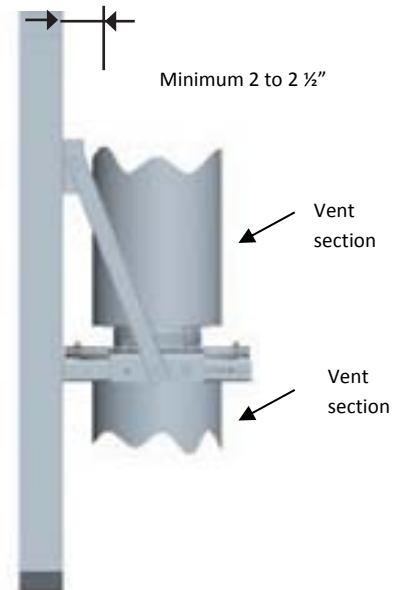


Figure 33 – Heavy Duty Wall Support (WSHD) at Minimum distance

Illustration below shows the Heavy Duty Wall Support at the **MAXIMUM** distance from structure

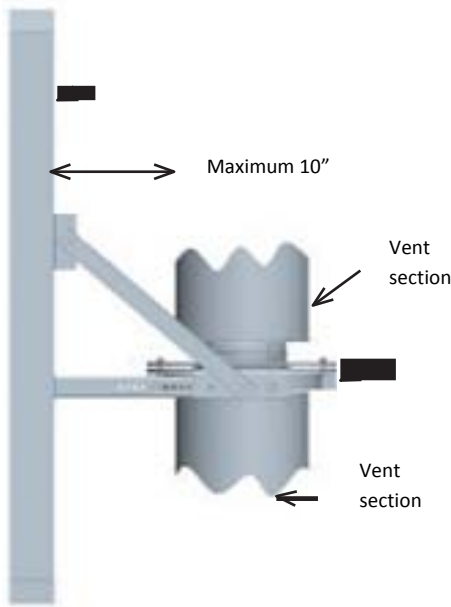


Figure 34 – Heavy Duty Wall Support (WSHD) at Maximum distance

HEAVY DUTY WALL GUIDE (WGHD)

The Heavy Duty Wall Guide is designed to complement the Heavy Duty Wall Support (See **Figure 32**). It is used as a lateral guide and is installed immediately below the outer closure band near the duct joint. The outer band must be able to move away from the Heavy Duty Wall Guide when thermal expansion occurs. The Heavy Duty Wall Guide is bolted together with hardware provided to form a rigid assembly.

NOTE: Seal joint with S-375 sealant above and below support if exposed to weather.

⚠ WARNING: RISK OF FIRE - DO NOT ATTACH THE WALL GUIDE TO COMBUSTIBLE CONSTRUCTION

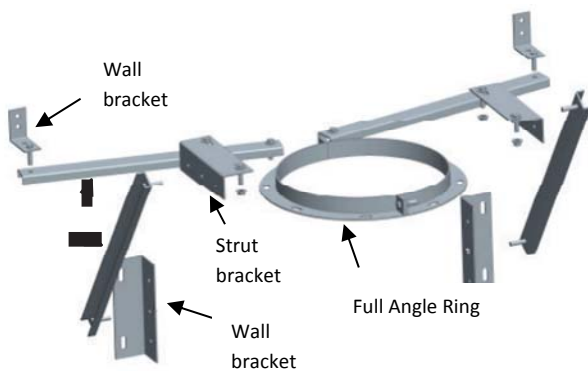


Figure 35 – Heavy Duty Wall Guide (WGHD)

HEAVY DUTY FLOOR GUIDE (FGHD)

A Heavy Duty Floor Guide is similar in function to a Heavy Duty Wall Guide or Full Angle Ring, but has been modified for use at floor penetrations. The angle brackets and straps hold the FGHD centered in the floor penetration. Maximum floor opening "X" is the Duct ID + 10"

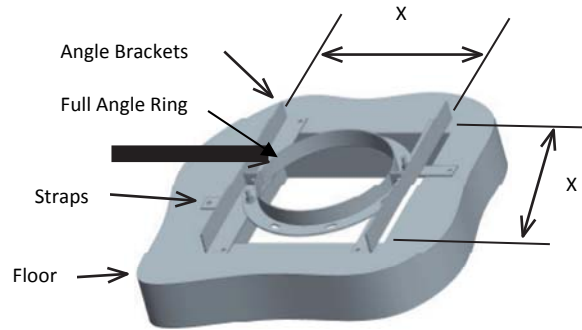


Figure 36 – Heavy Duty Floor Guide (FGHD)

FULL ANGLE RING (FAR)

A Full Angle Ring is used as a guide to prevent the duct from flexing due to lateral loading. The angle ring is split for ease of installation. It is 1/8" larger inside diameter than the outside diameter of the duct to allow movement of the duct inside the ring.

Most supports incorporate the use of the Full Angle Ring due to it providing structural integrity to the duct.



Figure 37 – Full Angle Ring (FAR)

HALF ANGLE RING (HAR)

A Half Angle Ring is used as a saddle in horizontal or sloped runs.



Figure 38 – Half Angle Ring (HAR)

NOTE:

Both the Full Angle Ring and the Half Angle Ring are designed to accept 1/2" threaded rod

SECTION E – GUIDELINE FOR LOCATION OF SUPPORTS

Supports can be used in different combinations to secure the duct in place.

ADJUSTABLE, VARIABLE and BELLOW LENGTH

To prevent the LA, LV or LB from sagging, it is recommended that the chimney section adjacent to the LA, LV or LB is supported or guided.

When necessary, properly guide an adjustable length (LA) by installing a Heavy Duty Wall Guide (WGHD) or any support immediately below the chimney joint on the adjacent section.

TEE SUPPORT

The Tees must be properly supported to protect them from bending forces. It can be done by means of an Anchor Plate (AP), Anchor Plate Length (APL) or Heavy Duty Wall Support (WSHD). When a Tee is used at the base of the vertical riser, the preferred location for the support is above the Tee, thus suspending the Tee.

ELBOW SUPPORT

Elbows are to be supported on one end with either an Anchor Plate (AP), an Anchor Plate Length (APL) or a Heavy Duty Wall Support (WSHD).

THROUGH FLOOR / CEILING SUPPORT

Supports for chimney that penetrate a non-combustible floor are to be positioned on the top side of the floor. Include supports as per the height limits in Table 3 and use either an Anchor Plate (AP) or an Anchor Plate Length (APL) installed above structural framing members.

THROUGH WALL SUPPORT

Chimney that penetrates a wall should be supported on both side of the penetration. It can be supported by bracing with a Half Angle Ring (HAR), an Anchor Plate (AP) or an Anchor Plate Length (APL).

SECTION F – ROOF PENETRATION and FLASHINGS

Flashing (F)

The flat Roof Flashing (F) is used in conjunction with Storm Collar (SC) for weatherization on a flat roof.

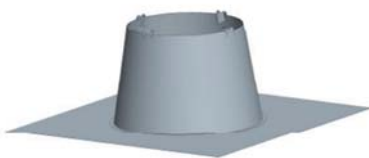


Figure 39 – Flat Roof Flashing (F)

Storm Collar (SC)

The storm collar is installed above the opening of the flashing and clamps to the outside of the vent. The top of the storm collar should be sealed using S-375

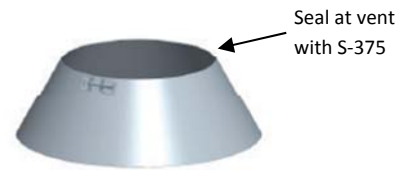


Figure 40 – Storm Collar (SC)

Adjustable Flashing (F30)

The Adjustable Flashing (F30) is used in conjunction with Storm Collar (SC) for weatherization on a flat roof with a 5 degree to 30 degree pitch.

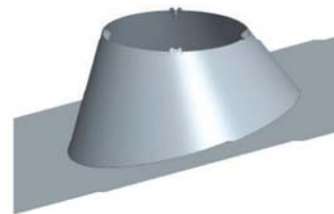
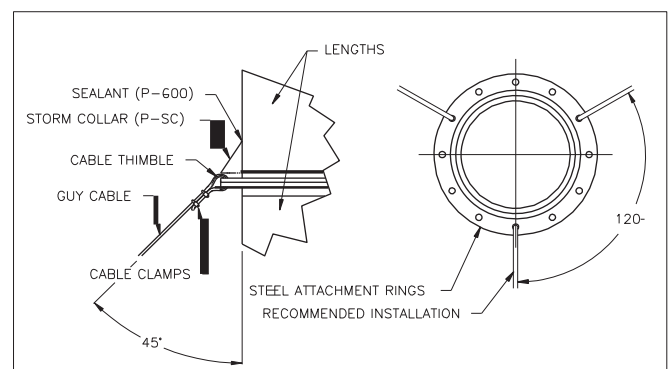


Figure 41 – Adjustable Flashing (F30)

GUYING AND BRACING

1. Proper guying and bracing is essential for part of the Chimney that extends above the roof or parapet wall. The grease duct at this point is subject to wind conditions and needs special attention for proper stabilization.
2. If the chimney above the roof does not exceed dimension H, no special guying or bracing is required. However, to protect the flashing from lateral movement, a guide must be installed at the roof level.
3. For chimney height above the roof that needs guying or bracing, a support, a small length and a expansion length must be installed near the roof level to absorb the thermal expansion and minimize this effect on the guy wires or brace.
4. When using guy wire, the cable must be slightly slack or loose to allow thermal expansion.
5. When using rigid bracing, the maximum vertical height between supports must be reduced to 5' to compensate thermal expansion.

Guy Section details and cable attachments



SECTION G – TERMINATION

GENERAL

An upward discharge (such as with an Exit Cone or Open Top) provides the most effective means of dispersing chimney gases into the atmosphere and away from immediate surroundings. Such terminations however, will allow entry of rain unless there is upward flow at high velocity. A Stack Cap is only partially effective in excluding rain. Its effectiveness depends on chimney gas flow rate, raindrop characteristics and wind velocity.

If rain is to enter the chimney, install a drain tee cap at the bottom of vertical run. Use a "P" trap in the drain if the system is under positive pressure.

EXIT CONE (P-EC)

The Exit Cone is of double wall construction, with separable inner and outer cones. The inner cone has a 28° included cone angle and is sized to increase outlet velocity to 1.5 times chimney velocity. It attaches with a standard Inner V-Band to the uppermost chimney pipe section. The outer cone is then pushed down into contact with the inner cone, clamped to the outer pipe, and the gap between cones is sealed with silicone. To prevent rain from reaching an appliance, this installation requires use of a Drain Section (P-DS), drained Tee or both in the vertical chimney. It is recommended to fasten (3) self-tapping screws around the bottom circumference of the exit cone outer wall (120° apart) into the upper outer wall of the pipe section below. Do not penetrate the inner wall.

RAIN CAP (RC)

NOTE: Stack Caps are not recommended for use with engine or turbine exhausts. The Stack Cap combines partial protection against rain entry with low exit flow resistance. (Resistance coefficient is roughly 0.05 velocity heads.) It is mounted to the end of a standard pipe section by use of the standard V-Band. A Closure Ring is provided as part of the Stack Cap so that the insulating air space is maintained through the upper end of the chimney.

EXCESSIVE PRESSURE RELIEF VALVE (P-ER)

Excessive Pressure Relief Valves are intended to help control the venting of pressure which may occur during an exhaust system backfire. Engines have the potential to inject unburned fuel into an exhaust system during start up or due to an engine malfunction.

This unburned fuel creates a condition where a backfire could occur. The Explosion Relief Valve will help prevent damage to other parts such as Flex Connectors, Silencers, Catalytic Converters, Convoluted Bellows and Heat Recovery Equipment.

Further precedence for use of Excessive Pressure Relief Valves can be found in NFPA 37, "Standards for the Installation and Use of Stationary Combustion Engines and Gas Turbines". The Excessive Pressure Relief Valve should be located in the beginning of the system and is supplied with bolts, washers, nuts, and gasket to provide a complete gas tight connection to the 125/150 lb. ANSI flanged Flange Adapter. The orientation of the Relief Valve should be positioned upright, as shown **Figure 42** for optimum performance.

MAINTENANCE OF ER VALVE IF USED OUTDOORS: It is RECOMMENDED to apply an exterior grade high heat paint to the Guide Plate, Valve Seat, Valve Plate, and Flange Adapter to ensure maximum corrosion resistance. (Ex. Rust-Oleum V200 series High Heat Industrial Aerosol) Caution: This device is designed to relieve excessive pressure (27" WC with standard springs) in the case of an engine malfunction for the sole purpose of protecting the physical integrity of the exhaust system and related parts. If such malfunction occurs, the device will release hot gases, sparks and/or flames into the immediate vicinity of the area it is located in.

As such, this device should never be installed where human contact may occur due to such release.

Excessive Pressure Relief Valve

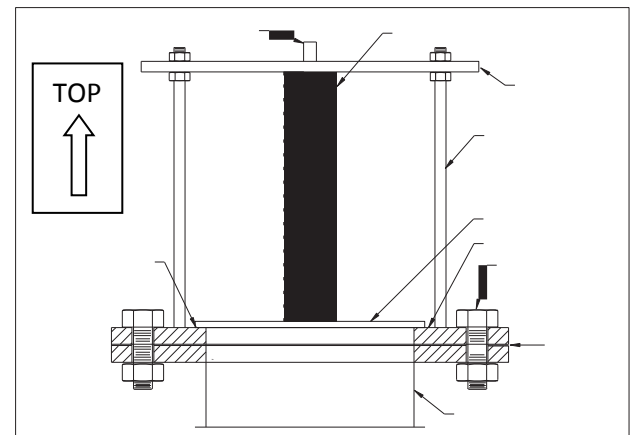


Figure 42 – Excessive Pressure Relief Valve

GENERAL INFORMATION

M&G DuraVent reserves the right to make changes at any time, without notice, in design, materials, specifications, prices. Consult your local distributor for chimney system code information.

WARRANTY

These products have a 15-year limited warranty. Please read the warranty to be familiar with its coverage.

Retain this manual. File it with your other documents for future reference.

PRODUCT REFERENCE INFORMATION

Please contact M&G DuraVent for the phone number of your nearest DuraVent dealer who will answer your questions or address your concerns.

Further information may be obtained by visiting:

www.duravent.com